

**BIOAVAILABLE CAROTENOID-CYCLODEXTRIN FORMULATIONS  
FOR SOFT-GELS AND OTHER ENCAPSULATION SYSTEMS**

**ABSTRACT OF THE DISCLOSURE**

The present invention describes an improved commercial process for the production of carotenoid-cyclodextrin complexes and formulation of the complex for human ingestion. Complexation with cyclodextrins (e.g.,  $\alpha$ -cyclodextrin,  $\beta$ -cyclodextrin,  $\gamma$ -cyclodextrin, or HP- $\beta$ -cyclodextrin) significantly improves the uptake 5 of carotenoids (e.g., lycopene, lutein, or zeaxanthin) and their mixtures *in vitro*. The method for making such complexes includes forming a carotenoid/cyclodextrin complex; freezing drying said carotenoid/cyclodextrin complex; and blending said 10 freeze-dried carotenoid/cyclodextrin complex with a mixture of lecithin and a vegetable oil or a vegetable oil suitable for soft gelatin capsules. The cyclodextrin/carotenoid complex can be formed in a molar ratio of between about 0.5:1.0 and 10:1. *In vivo*, in a human study, the lutein/ $\gamma$ -cyclodextrin complex formulated in lecithin-oil or oil showed a better absorption of lutein, as compared to the free lutein-oil formulation.